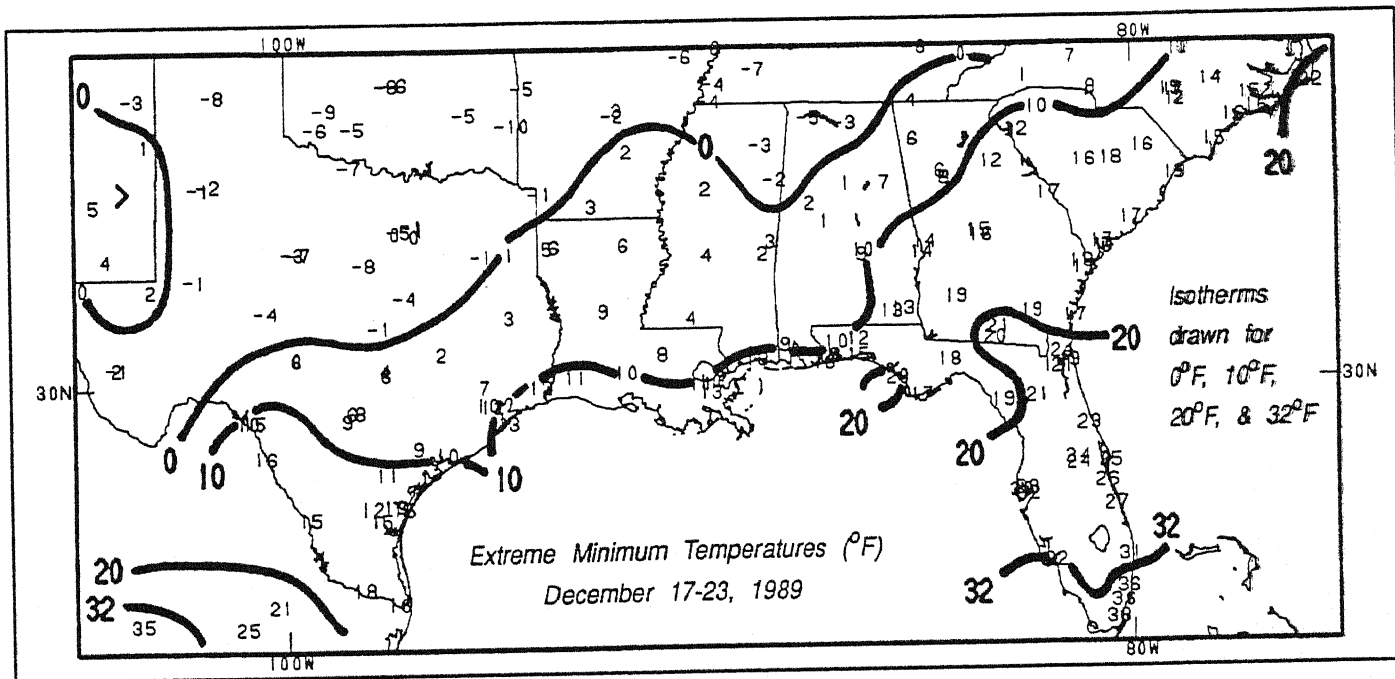


# WEEKLY CLIMATE BULLETIN

No. 89/51

Washington, DC

December 23, 1989



ANOTHER WEEK OF WINTERY WEATHER BLASTED THE EASTERN TWO-THIRDS OF THE NATION, INCLUDING THE DEEP SOUTH, AS READINGS IN THE TEENS WERE RECORDED ALONG THE GULF COAST AND IN SOUTHERN TEXAS WHILE FREEZING TEMPERATURES OCCURRED THROUGHOUT FLORIDA EXCEPT IN THE EXTREME SOUTHERN PORTIONS OF THE STATE. HUNDREDS OF DAILY MINIMUM TEMPERATURE RECORDS WERE BROKEN DURING THE WEEK, ESPECIALLY ON DECEMBER 22 AND 23, WHEN OVER 250 NEW RECORDS WERE ESTABLISHED. IN ADDITION, DOZENS OF STATIONS SET ALL-TIME DECEMBER LOWS WHILE SEVERAL LOCATIONS REPORTED THE LOWEST TEMPERATURE EVER ON RECORD. THE COLD SPELL CAUSED SEVERE AND WIDESPREAD DAMAGE TO THE TEXAS AND FLORIDA CITRUS AND VEGETABLE CROPS, AND UTILITIES WERE STRAINED TO MEET EXCESSIVE HEATING DEMANDS.

UNITED STATES DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL WEATHER SERVICE - NATIONAL METEOROLOGICAL CENTER  
**CLIMATE ANALYSIS CENTER**

# WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- Highlights of major climatic events and anomalies.
- U.S. climatic conditions for the previous week.
- U.S. apparent temperatures (summer) or wind chill (winter).
- U.S. cooling degree days (summer) or heating degree days (winter).
- Global two-week temperature anomalies.
- Global four-week precipitation anomalies.
- Global monthly temperature and precipitation anomalies.
- Global three-month precipitation anomalies (once a month).
- Global twelve-month precipitation anomalies (every three months).
- Global three-month temperature anomalies for winter and summer seasons.
- Special climate summaries, explanations, etc. (as appropriate).

*Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.*

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# GLOBAL CLIMATE HIGHLIGHTS

## MAJOR EVENTS AND ANOMALIES AS OF DECEMBER 23, 1989

### 1. Western United States:

#### SUBTLE LONG-TERM DRYNESS SLOWLY INTENSIFIES.

December, normally one of the wettest months of the year along the Pacific Coast, has been extremely dry. Little or no precipitation has fallen since the beginning of the month, and concerns are developing about a fourth consecutive subnormal rainy season in California [4 weeks].

### 2. Eastern Canada and United States:

#### BITTER COLD TIGHTENS GRIP ON EASTERN U.S.

The lowest temperatures of the recent cold wave affected the region last week. Temperatures averaged as much as 19°C below normal, dropping down to -44°C in portions of Minnesota. Strong winds accompanied the cold wave in many areas, allowing wind chills as low as -67°C to affect North Dakota. Hundreds of daily low temperature records were set, along with dozens of all-time December minimum records. In addition, several locations observed the coldest weather on record. This cold wave ranks as one of the most severe in history to afflict the central and eastern U.S. [8 weeks].

### 3. Central Great Plains and Western Corn Belt:

#### FIRST SUBSTANTIAL PRECIPITATION SINCE OCTOBER.

While amounts were small, the 5 to 13 mm which fell in northeastern Kansas and portions of northern Oklahoma provided limited relief to parched soils. Elsewhere, less than 5 mm was noted as cold, dry conditions dominated [14 weeks].

### 4. Eastern Brazil:

#### HEAVY RAINS CAUSE EXTENSIVE DAMAGE.

The eastern Brazilian state of Bahia received nearly 129 mm in less than 24 hours as rains inundated the area. The press reported that vast sections of highways were washed out, and floods caused widespread crop and property damage. The heavy rains covered much of the country with many stations reporting totals in excess of 125 mm to as much as 280 mm [4 weeks].

### 5. Southern and Central Europe:

#### MILD WEATHER ENGULFS CONTINENT.

Temperatures averaged up to 13°C above normal in portions of Yugoslavia as only Scandinavia and the British Isles evaded the warm outbreak. The anomalous warmth expanded northeastward from the Iberian Peninsula where above normal temperatures have been recorded for the last ten weeks. Readings above 20°C were common throughout France and the Balkan states [2 weeks].

### 6. Iberian Peninsula:

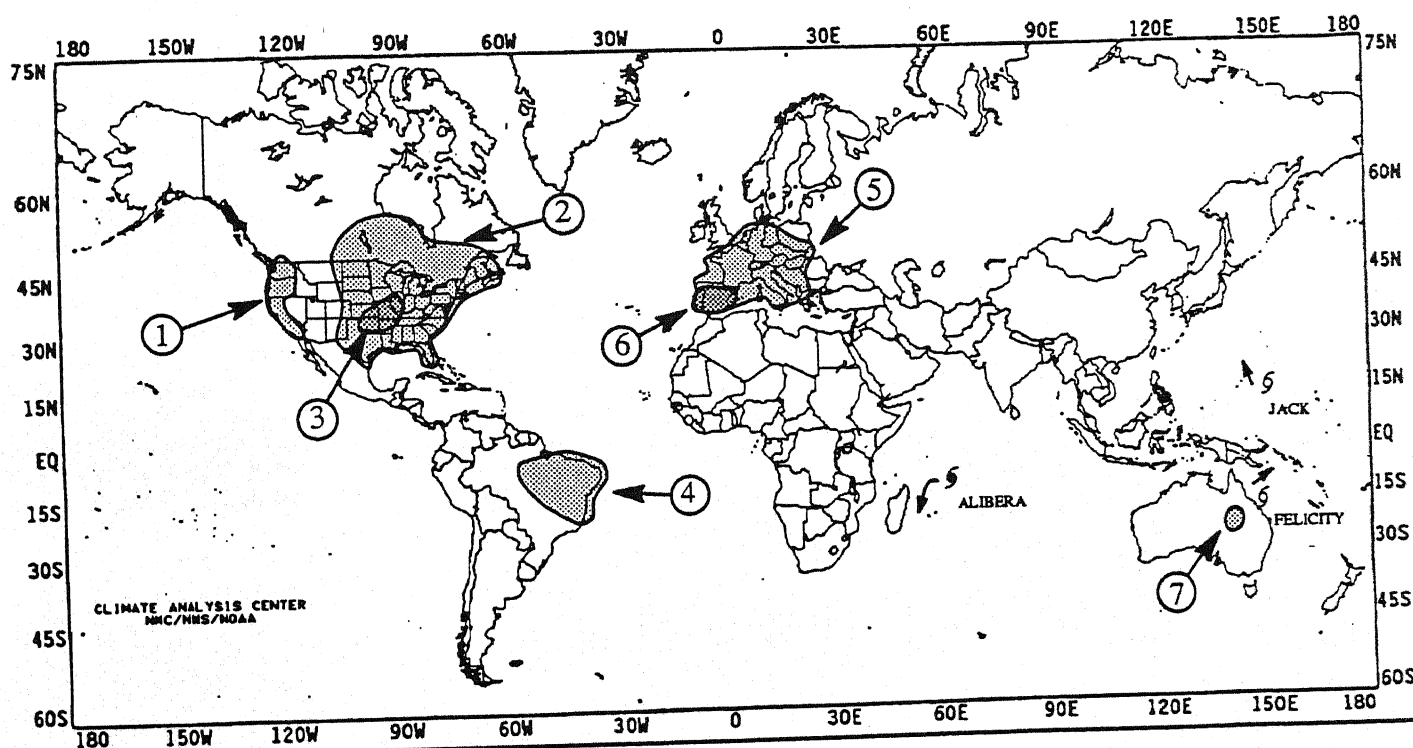
#### ANOMALOUS WETNESS BEGINS TO SUBSIDE.

After several weeks of torrential rains, the southern and eastern portions of Spain experienced near normal rainfall. Up to 177 mm fell on normally wet sections of northwestern Spain and Portugal last week [Ending at 7 weeks].

### 7. Australia:

#### WET SPELL ENDS.

Less than 5 mm of rain fell across northeastern Australia as cool, dry air moved into Queensland [Ended at 7 weeks].



**EXPLANATION**  
**TEXT:** Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.  
**MAP:** Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

# UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF DECEMBER 17 THROUGH DECEMBER 23, 1989

For the second successive week, frigid Arctic air grasped the eastern two-thirds of the country while above normal temperatures persisted in Alaska. Little or no precipitation generally accompanied the record cold, although heavy lake-effect snows buried portions of the Great Lakes and Appalachian snowbelt regions. In the South, a late-week winter storm dumped sleet and snow along portions of the western and central Gulf Coast, and by the week's end, had glazed much of northern Florida with freezing rain and sleet and blanketed coastal sections of Georgia and the Carolinas with heavy snow.

Early in the week, high pressure prevailed throughout the eastern half of the nation as dozens of stations, mainly in the Ohio Valley and central Appalachians, observed record daily minimum temperatures. A low pressure center in the northwestern Gulf of Mexico brought lightrain and some frozen precipitation to the western and central Gulf Coast states. Reinforcement of the bitterly cold air came in the form of an arctic front that produced light snow in parts of the nation's midsection and heavy snows in the Colorado Rockies. Seasonable temperatures and dry weather occurred in the Far West

By mid-week, another arctic front pushed southeastward from the northern Plains as readings plunged under  $-20^{\circ}\text{F}$  in the north-central U.S. and strong winds produced life-threatening wind chills near  $-80^{\circ}\text{F}$  in the Dakotas and Montana. Heavy snow squalls continued in the Great Lakes snowbelt regions. The town of Pulaski, NY was buried under four feet of snow overnight on Dec. 20-21. A stationary front across south-central Florida generated scattered rain showers. The official start of Winter (3:22 p.m. C.S.T. Dec. 21) was right on queue as the coldest air of this cold wave marched into the central U.S.

Towards the week's end, hundreds of daily minimum temperature records were broken east of the Rockies as readings plunged between  $-20^{\circ}\text{F}$  and  $-40^{\circ}\text{F}$  in the northern and central Plains and across the upper and middle Mississippi Valley. The town of Rochford, SD unofficially recorded  $-60^{\circ}\text{F}$  on Dec. 22, while Broadus and Hardin, MT officially fell to  $-47^{\circ}\text{F}$ . Subzero temperatures were recorded as far south as central Texas and northern Mississippi and Alabama, while lows in the teens were common along the Gulf Coast (see front cover). In addition, dozens of stations reported the lowest December temperature on record, and several locations observed their all-time lowest reading (e.g.  $-27^{\circ}\text{F}$  at Goodland, KS on Dec. 22). Based upon the number of shattered record lows, this cold wave, along with those of December 1983 and February 1899, has been one of the most severe in history for the central and eastern U.S. Widespread and severe damage to the Texas and Florida citrus and vegetable crops was reported, and utility companies were strained to meet the record heating demand.

Along with the cold, a storm system developed and rapidly intensified off the southern Atlantic Coast late Friday. Earlier in the day, Galveston, TX and New Orleans, LA received an inch of snow. Light snow fell on top of ice in northern Florida, while further north, heavy snows and strong winds created blizzard conditions along coastal sections of Georgia and the Carolinas. By Sunday, snow totals

were 15 inches at Wilmington, NC and 14 inches at both Myrtle Beach, SC and Cape Hatteras, NC.

With the exception of a cold front and its associated showers along the Pacific Northwest Coast, dry weather continued in the remainder of the West. In Oregon and California, stagnant air created dense fog in the valleys. Cool and dry conditions persisted across most of Hawaii. Temperatures moderated in Alaska from the prior week's exceptionally mild weather while heavy rains soaked parts of the south-central and southeastern Alaskan coasts.

According to the River Forecast Centers, the greatest weekly precipitation totals were limited to the extreme southeastern corner of the lower 48 states. Between 2 and 4 inches were recorded in central and northeastern Florida, along the coasts of Georgia and North Carolina, and at scattered locations in southern Alabama. Up to 10 inches of rain drenched coastal stations in south-central and southeastern Alaska (see Table 1). Light to moderate amounts fell along the Pacific Northwest Coast, across the northern Rockies, in parts of the central Plains, and throughout much of the Southeast, lower Midwest, mid-Atlantic, and Great Lakes.

Little or no precipitation was observed along the southern three-fourths of the Pacific Coast, in the Intermountain West, the central and southern Rockies, the southern and extreme northern Great Plains, the upper Midwest, the south-central Mississippi Valley, throughout the eastern half of New England, and in eastern portions of the Hawaiian Islands. So far, December, normally one of the wettest months in the Far West, has been extremely dry, especially throughout California and Oregon, as a ridge of high pressure anchored over the West Coast has veered Pacific storm systems northward into Canada and Alaska.

For the third consecutive week, subnormal weekly temperatures were reported in the eastern half of the nation while colder than normal conditions have persisted in the Northeast for five straight weeks. Throughout most of the central one-third of the country, temperatures averaged more than  $20^{\circ}\text{F}$  below normal. The largest negative departures (between  $-30^{\circ}\text{F}$  and  $-33^{\circ}\text{F}$ ) were found in parts of the northern and central Great Plains and in the western Ohio and middle Mississippi Valleys (see Table 3). Along the East Coast, departures generally ranged from  $-10^{\circ}\text{F}$  to  $-20^{\circ}\text{F}$ . Cooler than usual weather was also recorded in most of California and Oregon. In addition to the aforementioned record low temperatures, the presence of brisk northerly winds produced extremely dangerous wind chills (less than  $-20^{\circ}\text{F}$ ) as far south as the Gulf Coast (see Figure 1).

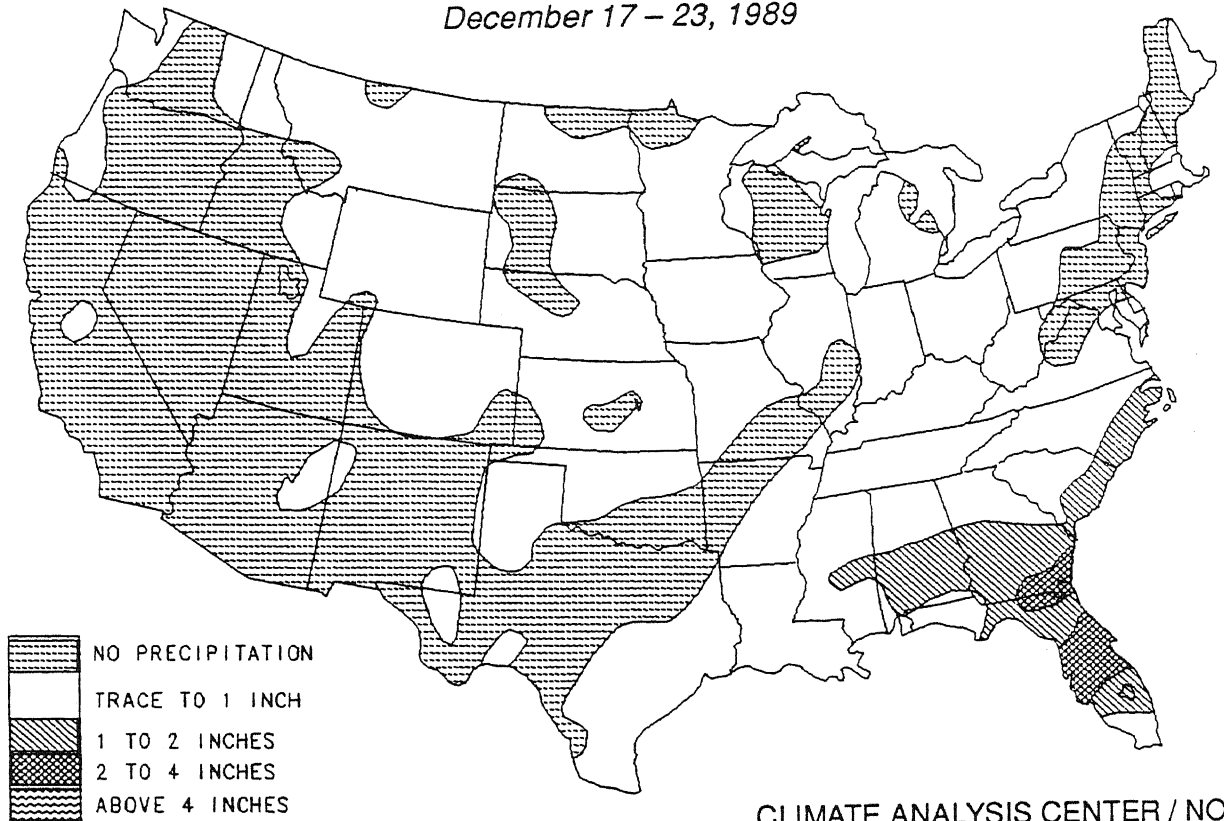
Above normal weekly temperatures in the contiguous U.S. were scarce. Temperatures in portions of the central and southern Rockies and the Pacific Northwest interior averaged up to  $4^{\circ}\text{F}$  above normal, but most locations were generally within  $2^{\circ}\text{F}$  of normal. Farther north, unseasonably mild weather continued for the third successive week throughout Alaska as departures ranged between  $+5^{\circ}\text{F}$  and  $+15^{\circ}\text{F}$  (see Table 2).

TABLE 1. Selected stations with 2.00 or more inches of precipitation for the week.

STATION	TOTAL (INCHES)	STATION	TOTAL (INCHES)
YAKUTAT, AK	9.57	ORLANDO, FL	2.40
CORDOVA/MILE 13, AK	4.54	DAYTONA BEACH, FL	2.40
VALDEZ, AK	4.13	SAVANNAH/HUNTER AFB, GA	2.33
CAPE CANAVERAL AFS, FL	3.31	TAMPA, FL	2.32
ANNETTE ISLAND, AK	3.14	VALDOSTA/MOODY AFB, GA	2.27
KETCHIKAN, AK	2.79	BRUNSWICK, GA	2.11
MELBOURNE, FL	2.75	SITKA, AK	2.10
KODIAK, AK	2.63		

### OBSERVED PRECIPITATION

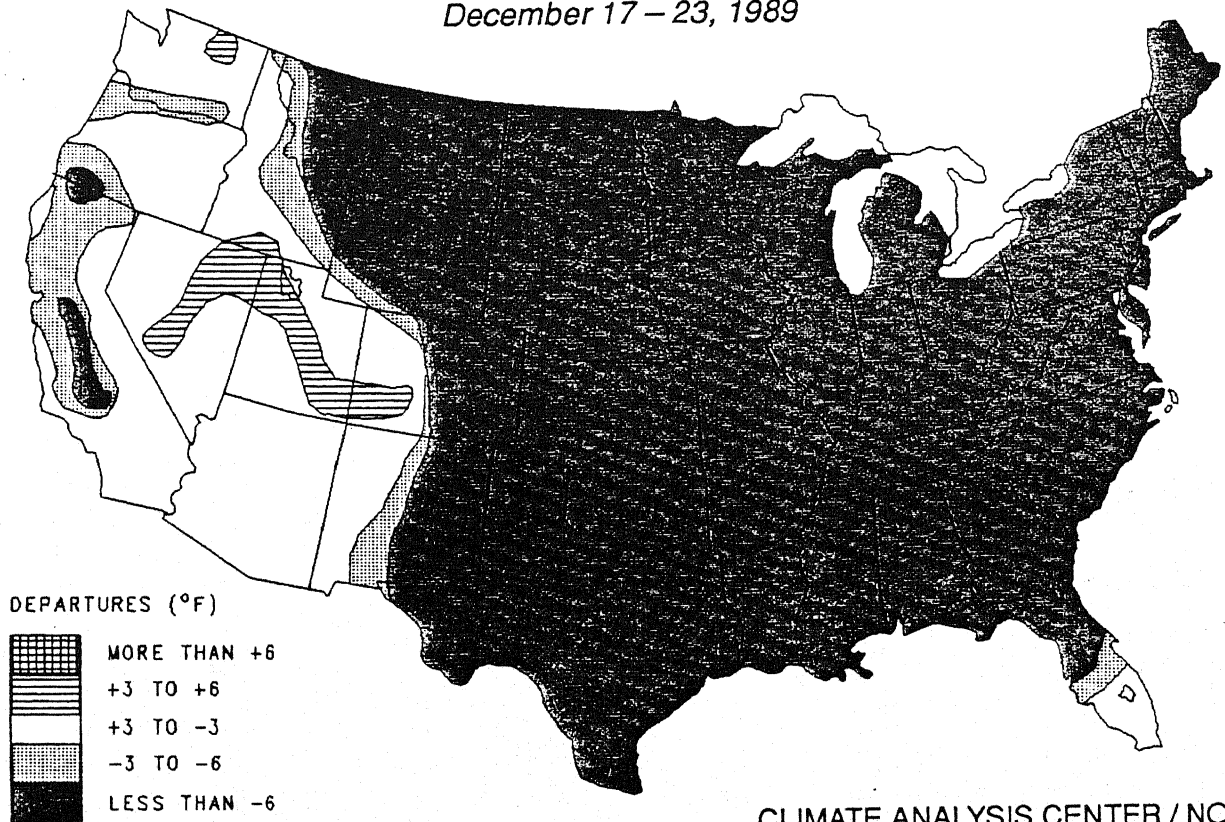
December 17 – 23, 1989



CLIMATE ANALYSIS CENTER / NOAA

### DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

December 17 – 23, 1989



CLIMATE ANALYSIS CENTER / NOAA

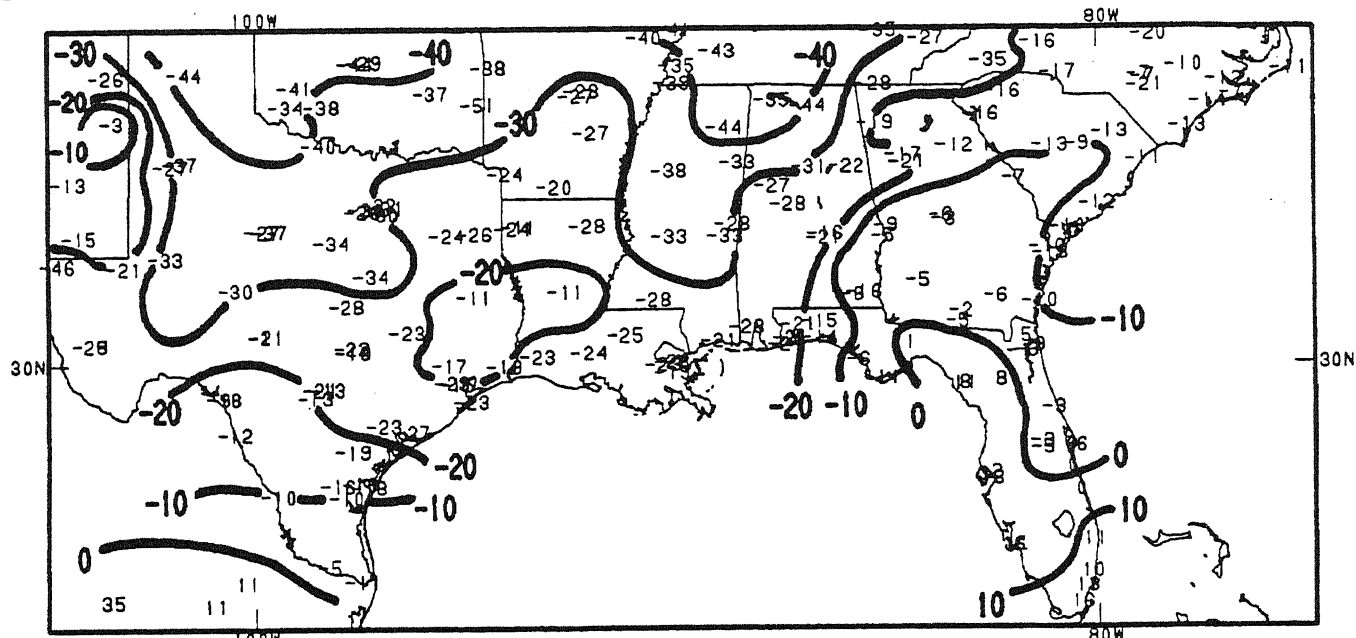


Figure 1. Extreme minimum wind chills (°F) during December 17-23, 1989. Isotherms are analyzed every 10°F starting at -40°F and ending at 10°F. Strong northerly winds accompanied record and near-record low temperatures, producing extremely dangerous wind chills throughout the Deep South. Wind chills below -20°F were common in the southern Great Plains and lower Mississippi Valley while values under -40°F blasted the central Great Plains and Tennessee Valley. Even northern Florida and southern Texas recorded subzero wind chills. Farther north, wind chills exceeded -60°F across the north-central U.S. and reached as low as -89°F in North Dakota (not shown).

**TABLE 2. Selected stations with temperatures averaging 7.0°F or more ABOVE normal for the week.**

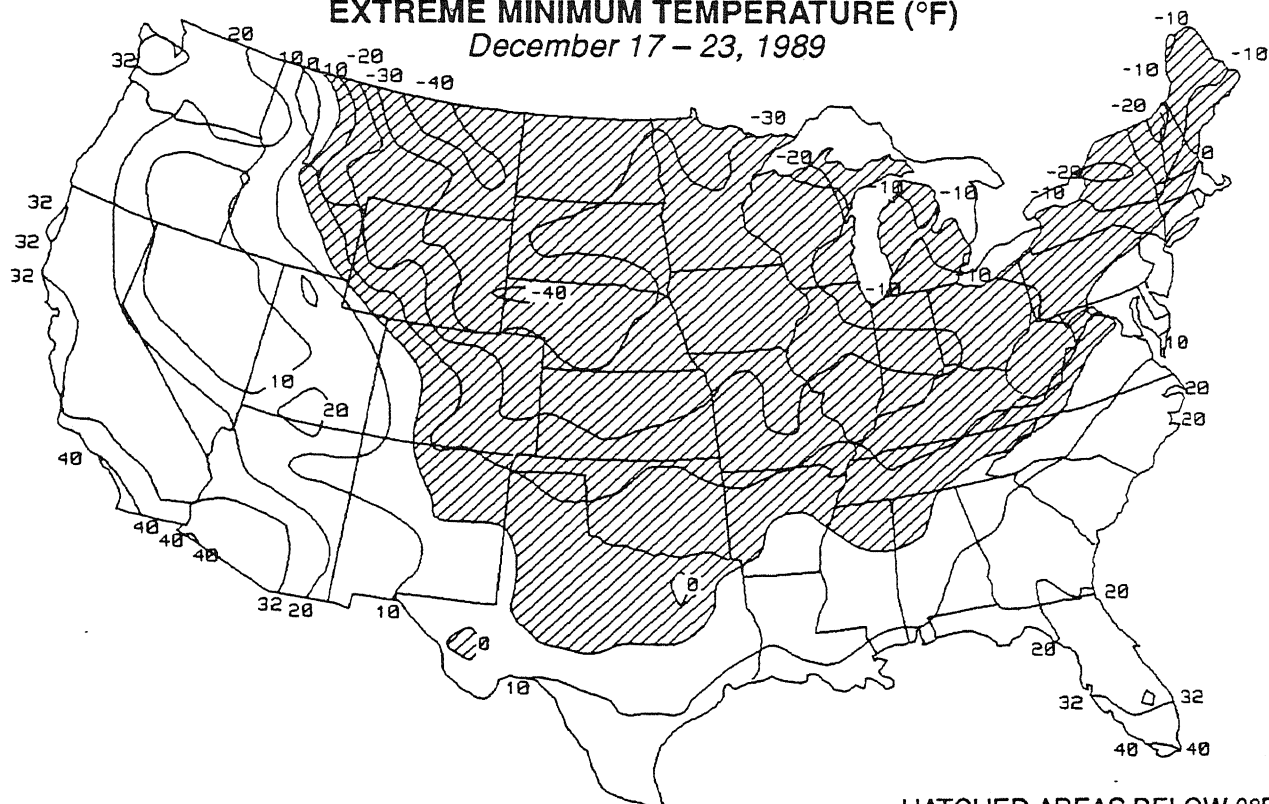
STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
GULKANA, AK	+16.2	8.9	BIG DELTA, AK	+10.5	4.8
KENAI, AK	+15.3	26.2	VALDEZ, AK	+9.5	28.0
FORT YUKON, AK	+13.5	-7.0	YAKUTAT, AK	+9.4	35.7
FAIRBANKS, AK	+13.4	2.0	SITKA, AK	+9.1	41.1
ILIAMNA, AK	+12.1	24.7	NOME, AK	+9.0	12.6
CORDOVA/MILE 13, AK	+11.9	34.6	SEXTON SUMMIT, OR	+8.6	44.9
TALKEETNA, AK	+11.2	19.3	KING SALMON, AK	+8.4	19.5
ANCHORAGE, AK	+11.1	24.2	HOMER, AK	+7.8	29.1
NORTHWAY, AK	+10.7	-8.2	KOTZEBUE, AK	+7.8	2.8
BETTLES, AK	+10.7	1.5	BLUE CANYON, CA	+7.4	46.5

**TABLE 3. Selected stations with temperatures averaging 28.0°F or more BELOW normal for the week.**

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
BELLEVILLE/SCOTT AFB, IL	-33.5	1.6	HAVRE, MT	-29.6	-11.4
DECATUR, IL	-32.2	-1.9	MILES CITY, MT	-29.3	-9.0
NORFOLK, NE	-31.4	-8.7	SIoux CITY, IA	-29.2	-7.3
VALENTINE, NE	-31.3	-8.1	CONCORDIA, KS	-29.0	1.1
SPRINGFIELD, IL	-30.4	-1.1	PARKERSBURG/WOOD CO., WV	-29.0	5.5
SCOTTSBLUFF, NE	-30.2	-3.3	CINCINNATI, OH	-28.6	4.3
KANSAS CITY/INTL., MO	-30.1	2.0	GRAND ISLAND, NE	-28.6	-3.2
EVANSVILLE, IN	-30.0	4.4	RAPID CITY, SD	-28.6	-3.4
INDIANAPOLIS, IN	-29.9	0.5	OMAHA/EPPLEY, NE	-28.4	-2.9
COLUMBIA, MO	-29.9	2.1	WILLISTON, ND	-28.4	-14.4
DICKINSON, ND	-29.9	-12.5	LINCOLN, NE	-28.3	-3.2
QUINCY, IL	-29.8	-1.4	ELKINS, WV	-28.2	3.4
BURLINGTON, IA	-29.8	-2.8	FORT WAYNE, IN	-28.2	-0.4
NORTH PLATTE, NE	-29.8	-4.7	GLASGOW, MT	-28.2	-13.0
ROLLA, MO	-29.7	4.1	BISMARCK, ND	-28.2	-14.3
TOPEKA, KS	-29.6	1.1	DAYTON, OH	-28.1	2.7
LEXINGTON, KY	-29.6	5.5	BOWLING GREEN, KY	-28.1	9.2
PEORIA, IL	-29.6	-3.0	MOLINE, IL	-28.1	-3.0
NORTH OMAHA, NE	-29.6	-3.6	PIERRE, SD	-28.1	-7.7



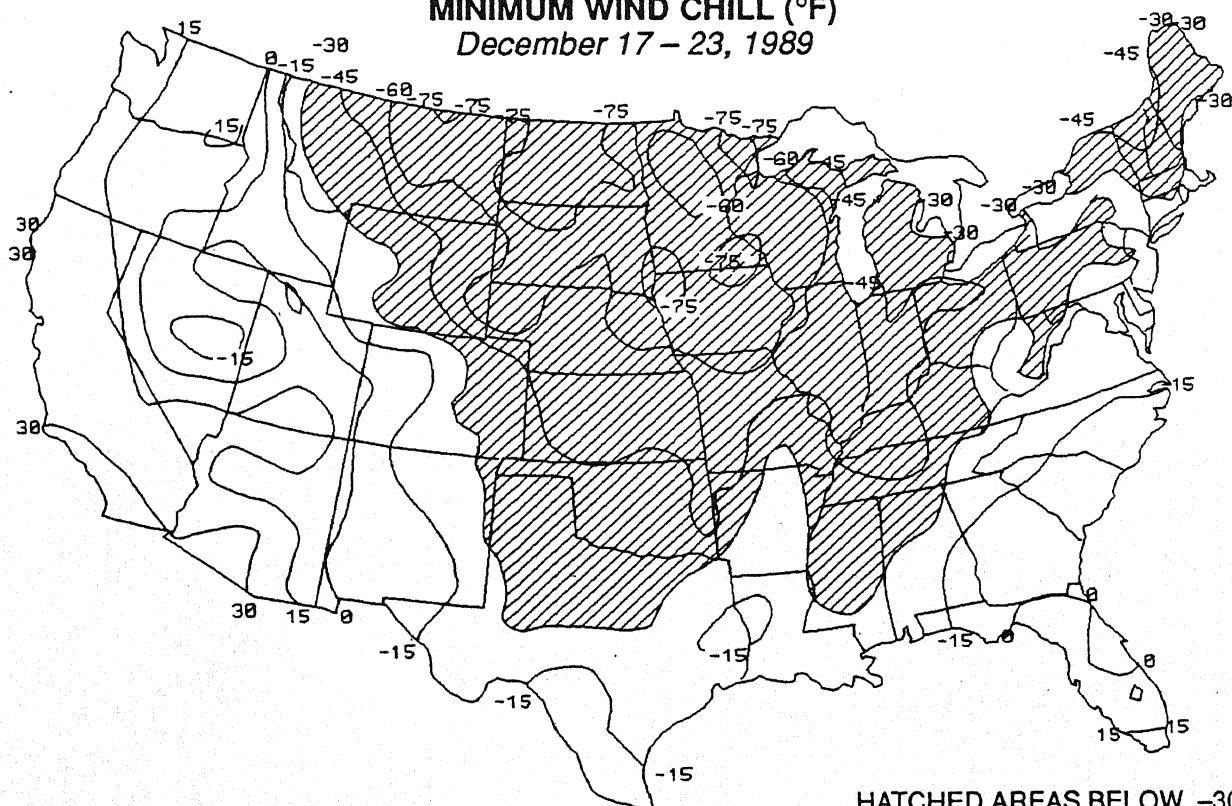
# **EXTREME MINIMUM TEMPERATURE (°F)** *December 17 – 23, 1989*



HATCHED AREAS BELOW 0°F

The coldest air in several years covered the U. S. east of the Rockies as readings plummeted under -40°F in parts of the northern High Plains (unofficially -60°F at Rockford, SD on Dec. 22), and subzero temperatures pushed as far south as central Texas. Only extreme southern Florida escaped freezing temperatures, however, lows dipped below 32°F on Dec. 24 and 25 throughout the state except for the Florida Keys (top). Exceptionally strong winds accompanied the Arctic air, producing extremely dangerous wind chills as low as -89°F in North Dakota and well under -60°F in the north-central U. S. (bottom).

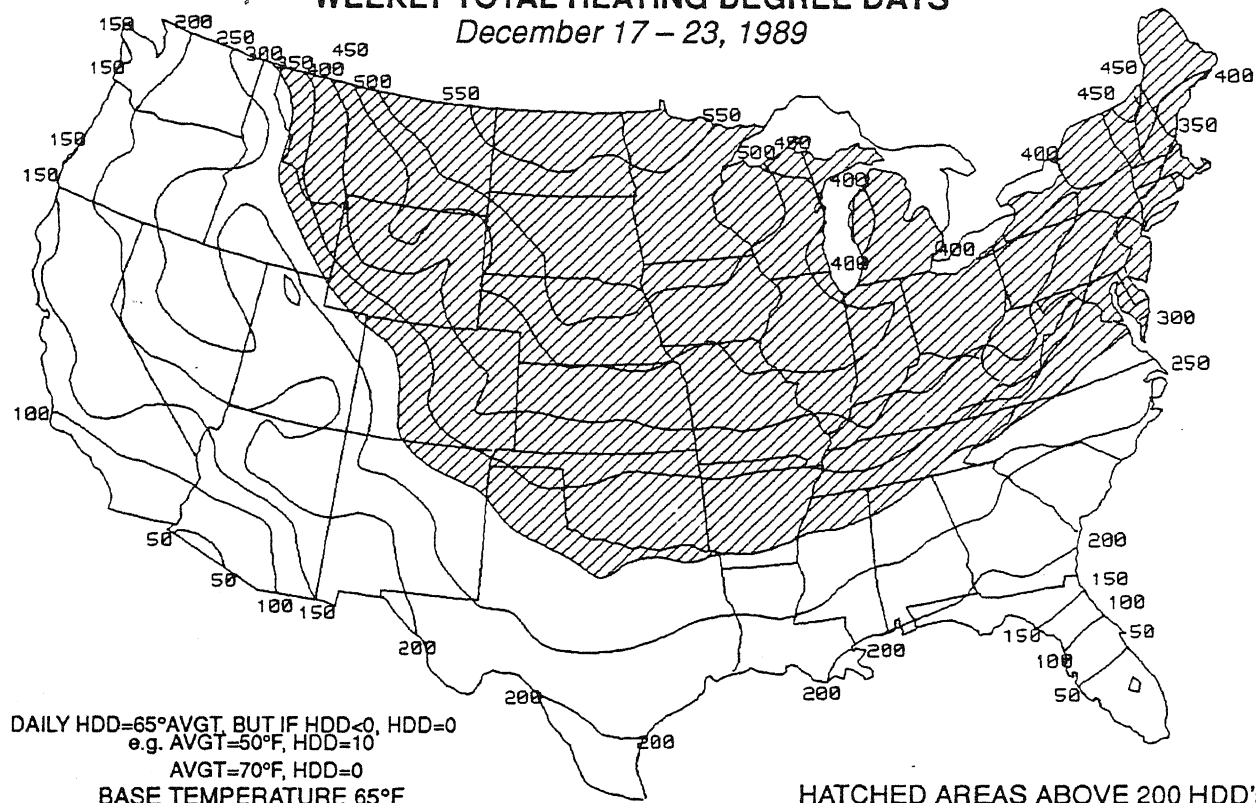
# **MINIMUM WIND CHILL (°F)** *December 17 – 23, 1989*



HATCHED AREAS BELOW -30°F

## WEEKLY TOTAL HEATING DEGREE DAYS

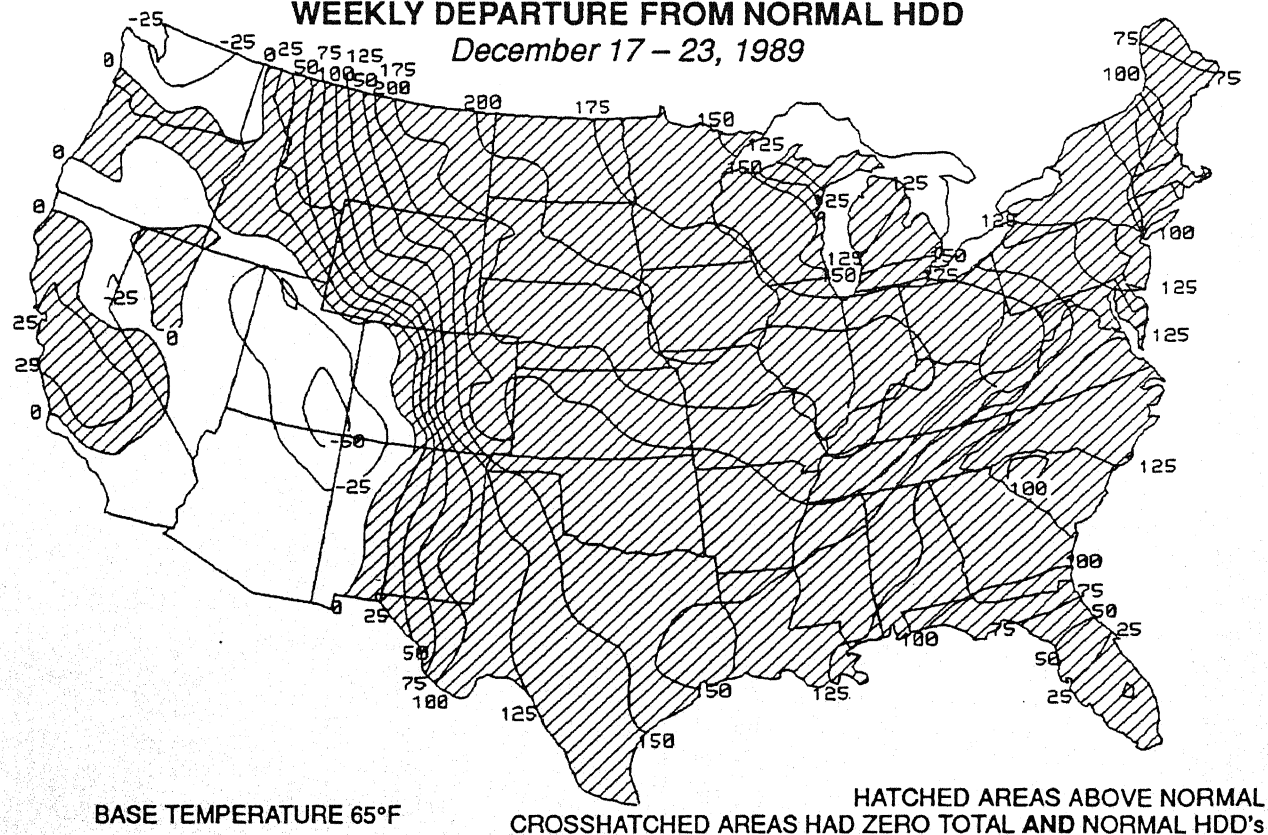
December 17 - 23, 1989



Record-breaking cold east of the Rockies caused tremendous heating requirements even in the Deep South, as heating usage surpassed 200 HDD's in the Gulf Coast states (normal HDD's about 100) and 500 HDD's in the northern Plains and upper Midwest (top). As expected, weekly temperatures averaging 20°F - 30°F below normal produced much above normal weekly heating demand across the eastern two-thirds of the country. Only parts of the Southwest and northern Washington experienced significant subnormal heating demands (bottom).

## WEEKLY DEPARTURE FROM NORMAL HDD

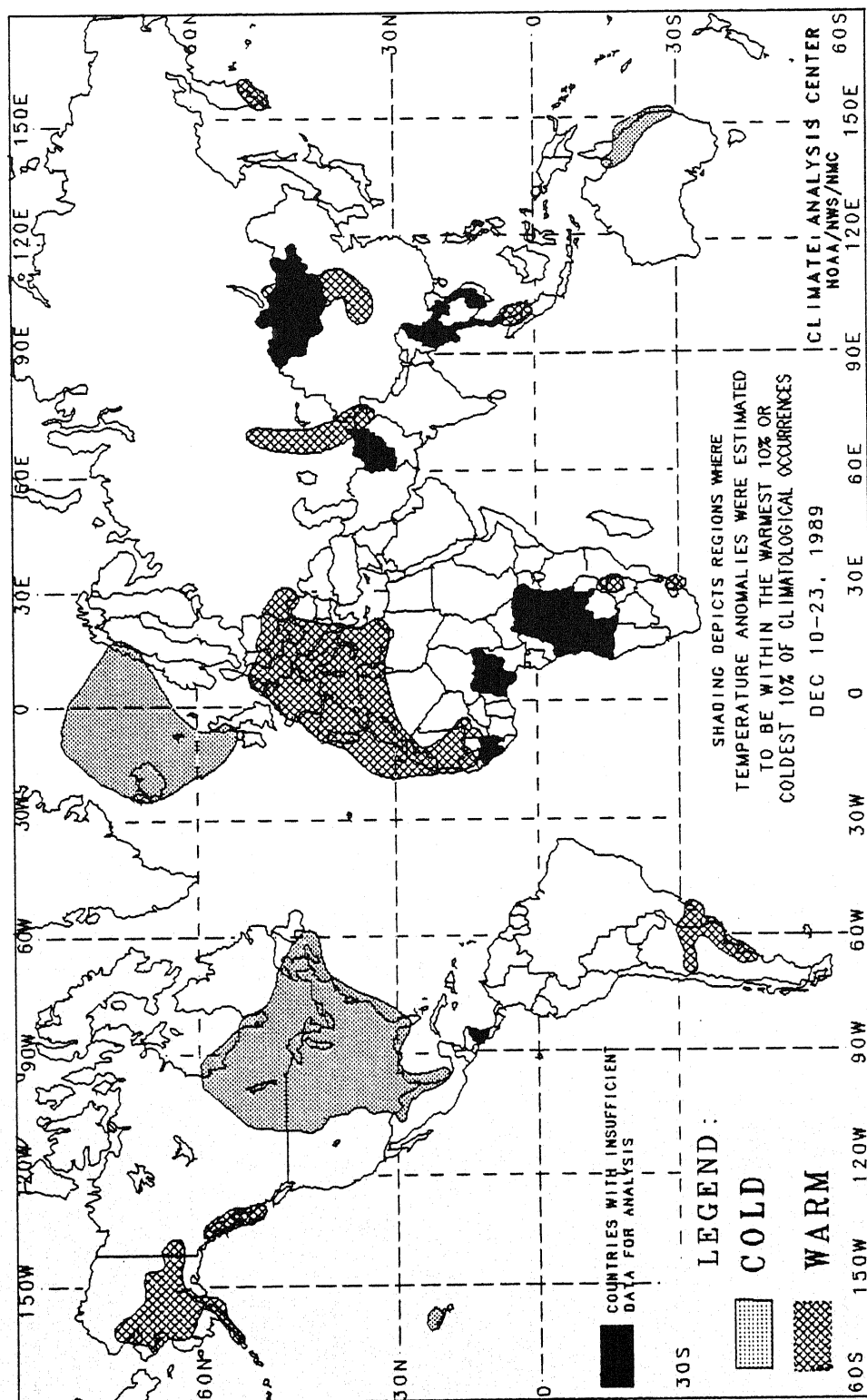
December 17 - 23, 1989





# GLOBAL TEMPERATURE ANOMALIES

2 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty-four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

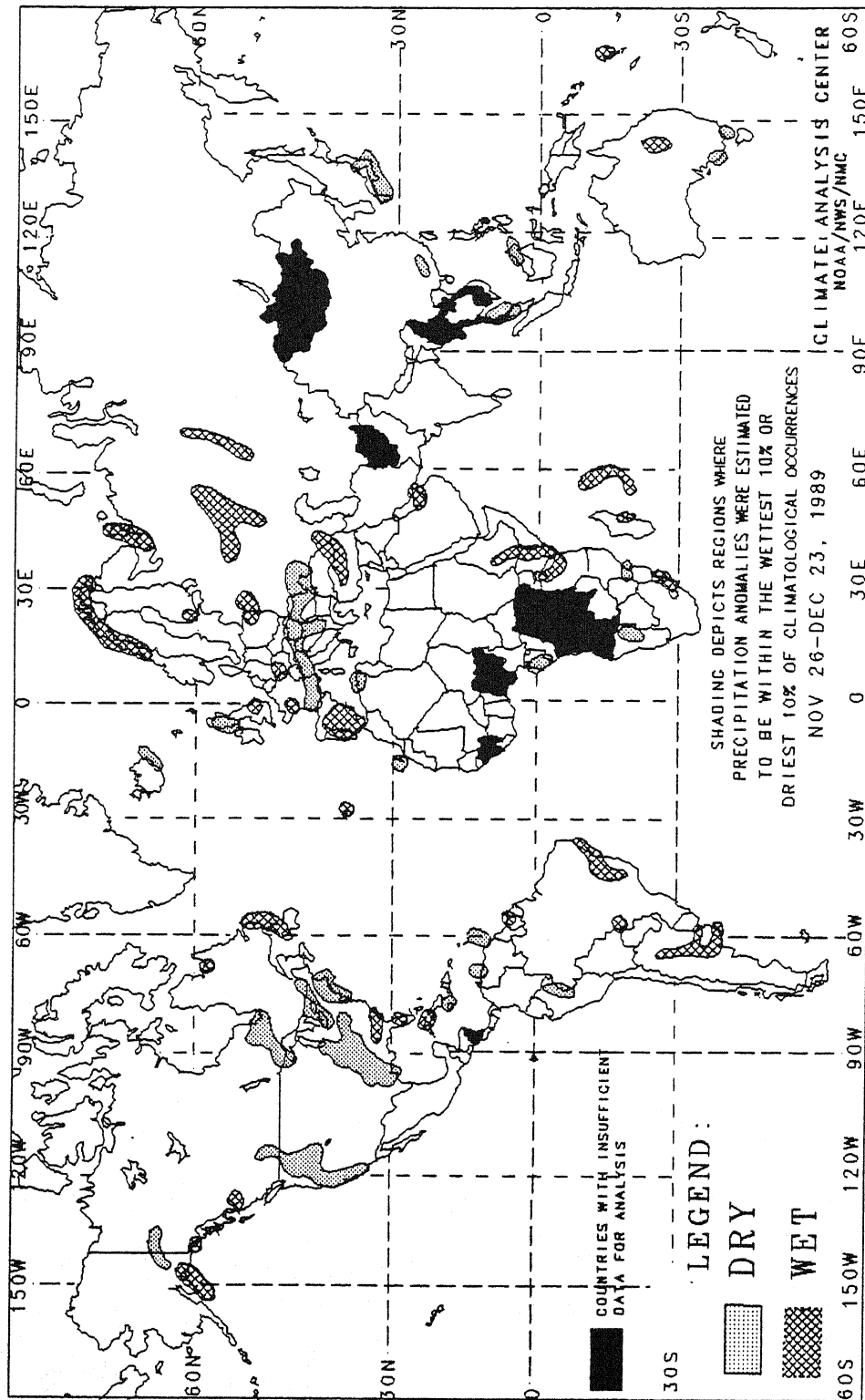
Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

# GLOBAL PRECIPITATION ANOMALIES

4 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

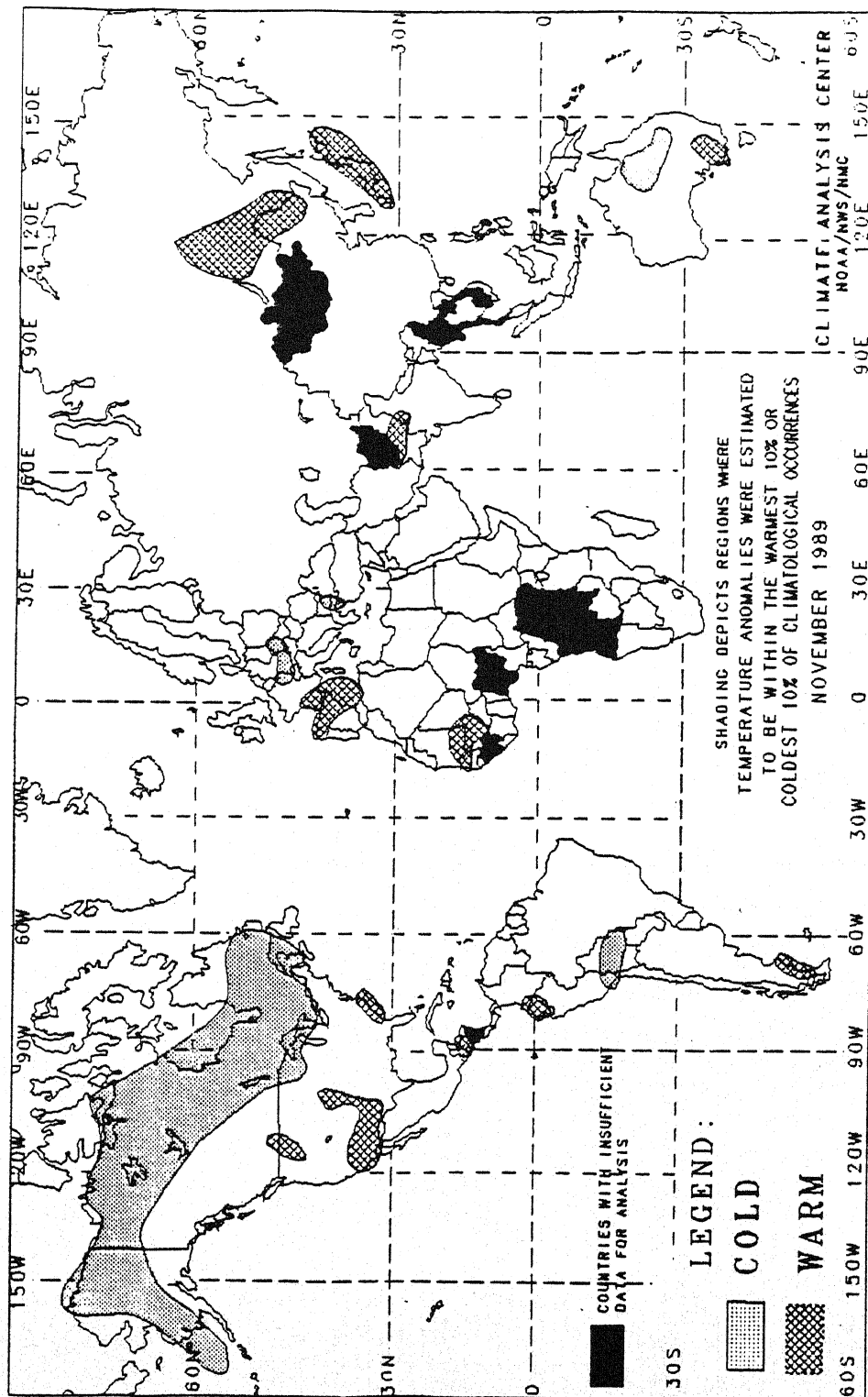
In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

# GLOBAL TEMPERATURE ANOMALIES

1 MONTH



The anomalies on this chart are based on approximately 2500 observing stations for which at least 26 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty-four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of one month temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

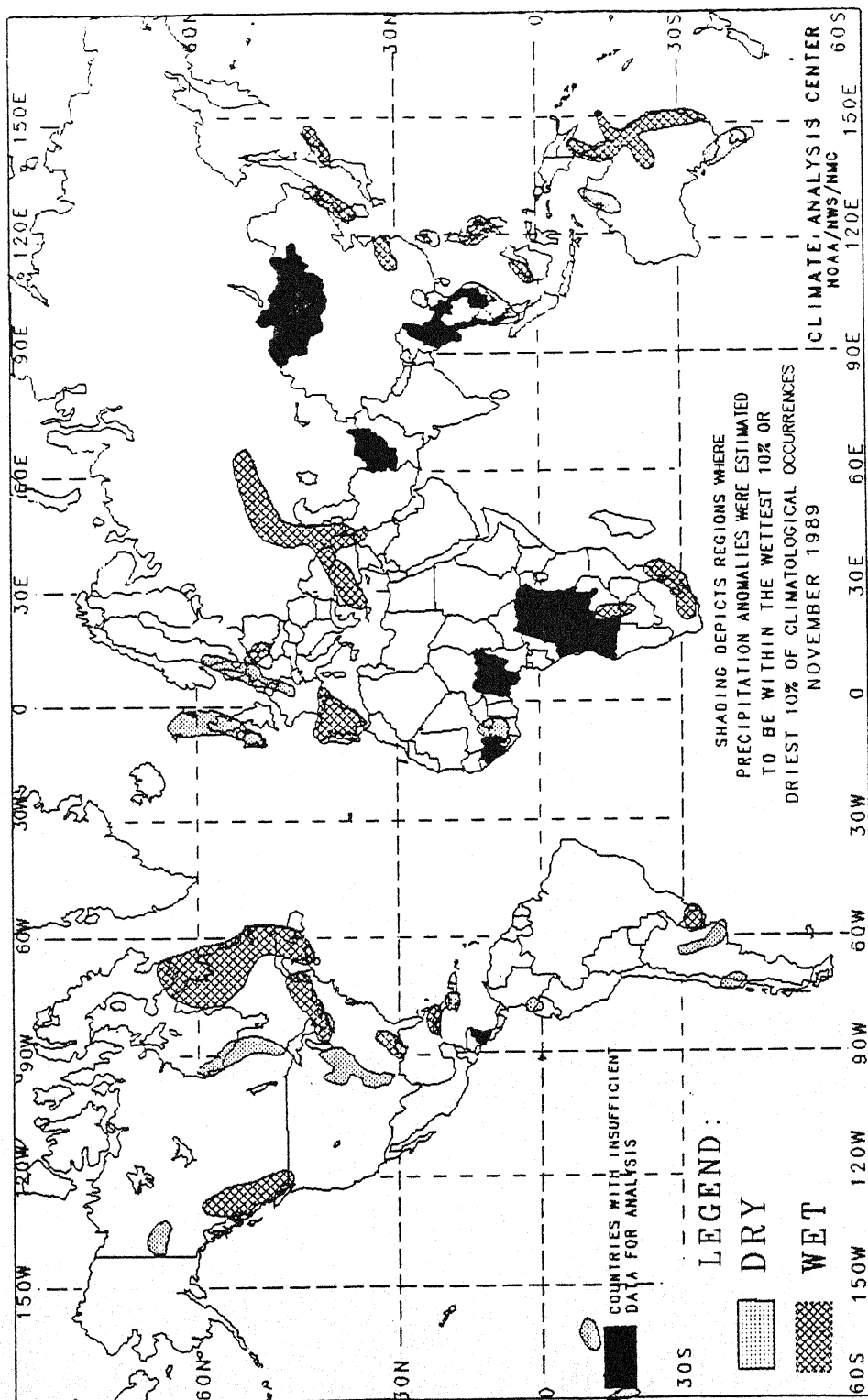
# PRINCIPAL TEMPERATURE ANOMALIES

NOVEMBER 1989

REGIONS AFFECTED	TEMPERATURE AVERAGE (°C)	DEPARTURE FROM NORMAL (°C)	COMMENTS
<b>NORTH AMERICA</b>			
Alaska, Canada, and adjacent United States	-30 to -1	-2 to -8	COLD - 2 to 10 weeks
Northwestern United States	+2 to +8	+2 to +4	MILD - 4 to 10 weeks
Southwestern United States	+6 to +19	+2 to +6	WARM - 2 to 5 weeks
Honduras	+20 to +32	+2 to +4	WARM - 2 to 4 weeks
<b>SOUTH AMERICA AND EASTERN PACIFIC</b>			
Ecuador	+15 to +27	Around +2	Very warm second half of November
Bolivia and Peru	+9 to +31	-2 to -5	COOL - 2 to 8 weeks
Southern Argentina	+13 to +18	+2 to +3	Very warm early and late in November
<b>EUROPE AND THE MIDDLE EAST</b>			
Central Europe	+1 to +4	-2 to -3	Very cold second half of November
Spain and adjacent France	+10 to +17	+2 to +3	WARM - 2 to 10 weeks
Western Turkey	+7 to +11	-2 to -3	Very cold second half of November
<b>AFRICA</b>			
Northern Algeria	+17 to +18	+2 to +3	Very warm second half of November
Sahel Region	+26 to +31	+2 to +3	WARM - 2 to 4 weeks
<b>ASIA</b>			
Pakistan and adjacent India	+11 to +22	+2 to +4	WARM - 2 to 6 weeks
Northeastern China and South Central Siberia	-18 to -4	+2 to +4	MILD - 2 to 10 weeks
Japan	+3 to +18	+2 to +3	Very warm first half of November
<b>AUSTRALIA AND WESTERN PACIFIC</b>			
North Central Australia	+22 to +28	-2 to -3	COOL - 2 to 6 weeks
Southeastern Australia	+16 to +23	+2 to +4	Very warm second half of November

# GLOBAL PRECIPITATION ANOMALIES

1 MONTH



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the one month period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total one month precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of one month precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

# PRINCIPAL PRECIPITATION ANOMALIES

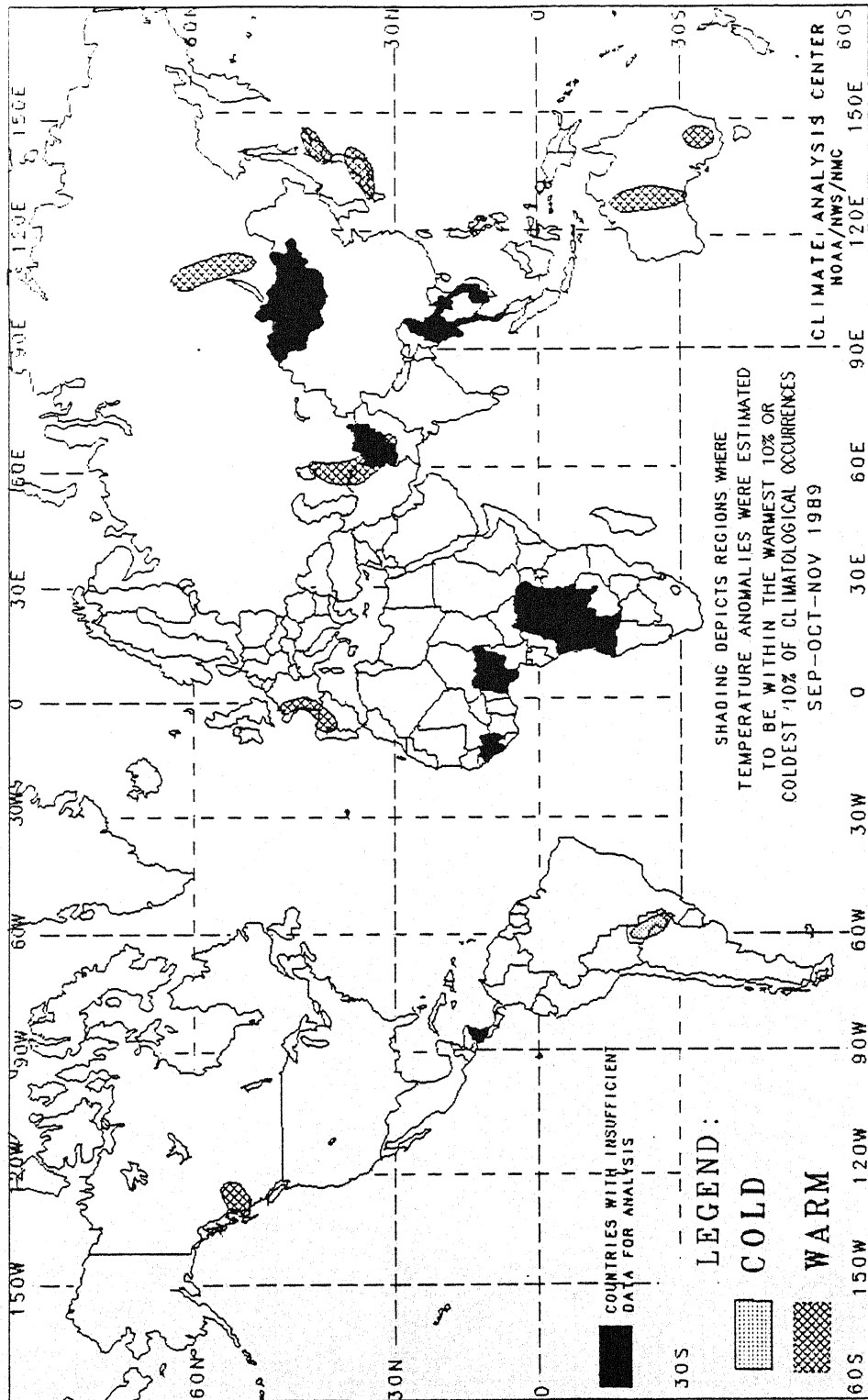
NOVEMBER 1989

REGIONS AFFECTED	PRECIPITATION TOTAL (MM)	PERCENT OF NORMAL	COMMENTS
<b>NORTH AMERICA</b>			
West Canada	0 to 9	0 to 42	DRY - 7 to 13 weeks
Southwestern Canada	61 to 596	120 to 274	WET - 2 to 4 weeks
Central Canada	0 to 7	0 to 18	DRY - 5 to 8 weeks
Eastern Canada	67 to 235	153 to 225	WET - 2 to 4 weeks
Great Lakes Region	167 to 176	126 to 308	WET - 4 to 5 weeks
Central United States	0 to 23	0 to 37	DRY - 4 to 13 weeks
Alabama and Louisiana	162 to 503	215 to 490	Heavy precipitation first half of November
Western Cuba	45 to 422	121 to 595	WET - 5 weeks
Jamaica	13 to 29	11 to 40	DRY - 14 weeks
<b>SOUTH AMERICA AND EASTERN PACIFIC</b>			
Northern Ecuador	11 to 31	10 to 30	DRY - 4 weeks
Cook Islands	22 to 91	10 to 37	DRY - 18 weeks
Fiji Islands	10 to 79	9 to 29	DRY - 4 weeks
Central Chile and adjacent Argentina	0 to 36	0 to 37	DRY - 5 weeks
East Central Argentina	8 to 43	7 to 46	DRY - 14 weeks
Uruguay	139 to 310	148 to 410	WET - 4 to 7 weeks
<b>EUROPE AND THE MIDDLE EAST</b>			
Ireland and Scotland	13 to 88	21 to 68	DRY - 4 to 6 weeks
Central Europe	9 to 48	19 to 73	DRY - 4 to 7 weeks
East Germany	40 to 105	138 to 250	Heavy precipitation early and late November
Spain and Portugal	36 to 369	140 to 740	Heavy precipitation second half of November
Turkey and Southwestern Soviet Union	16 to 468	111 to 389	Heavy precipitation second half of November
<b>AFRICA</b>			
Liberia and Ivory Coast	0 to 75	0 to 44	DRY - 4 to 11 weeks
Zambia and Botswana	110 to 209	186 to 234	Heavy precipitation first half of November
South Africa	42 to 453	206 to 553	WET - 5 to 11 weeks
<b>ASIA</b>			
Korea and adjacent Soviet Union	22 to 284	171 to 628	Heavy precipitation first half of November
Hokkaido, Japan	106 to 189	137 to 233	Heavy precipitation first half of November
East Central China	111 to 139	134 to 502	Heavy precipitation first half of November
South Central China	0 to 13	0 to 48	DRY - 9 to 14 weeks
Taiwan	0 to 74	0 to 56	DRY - 9 to 11 weeks
Malaysia and Vietnam	31 to 420	19 to 74	DRY - 5 to 7 weeks
Borneo, Malaysia	278 to 612	142 to 149	Heavy precipitation first half of November
<b>AUSTRALIA AND WESTERN PACIFIC</b>			
Philippines	2 to 471	6 to 71	DRY - 4 to 10 weeks
North Central Australia	4 to 40	13 to 59	DRY - 9 to 10 weeks
Eastern Australia	64 to 244	218 to 1830	Heavy precipitation early and late November
Southeastern Australia	11 to 35	22 to 53	DRY - 5 weeks



# GLOBAL TEMPERATURE ANOMALIES

3 MONTH



The anomalies on this chart are based on approximately 2500 observing stations for which at least 78 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty-four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

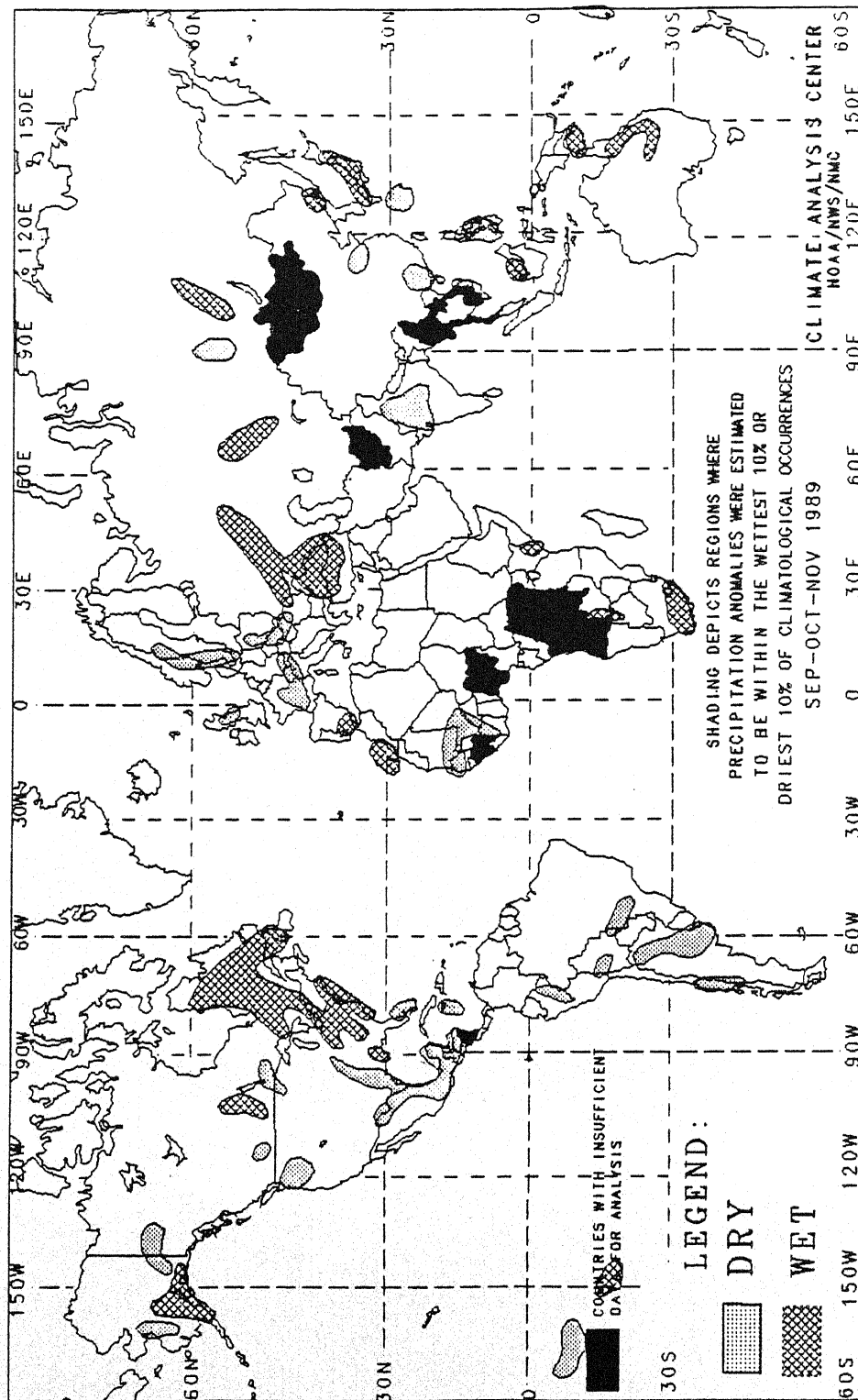
Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of three month temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

# GLOBAL PRECIPITATION ANOMALIES

3 MONTH



The anomalies on this chart are based on approximately 2500 observing stations for which at least 81 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

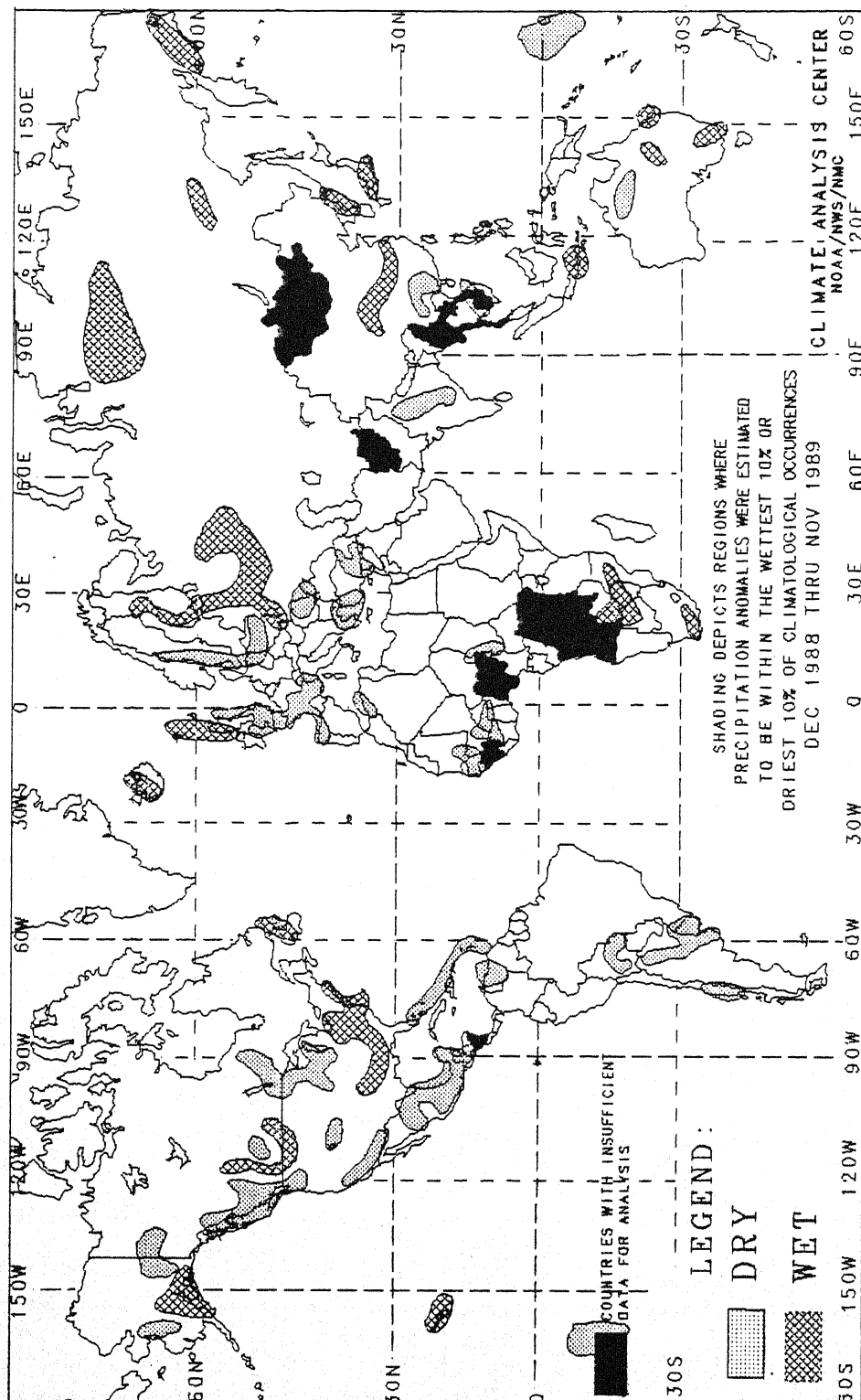
In climatologically arid regions where normal precipitation for the three month period is less than 50 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total three month precipitation exceeds 125 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of three month precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

# GLOBAL PRECIPITATION ANOMALIES

12 MONTH

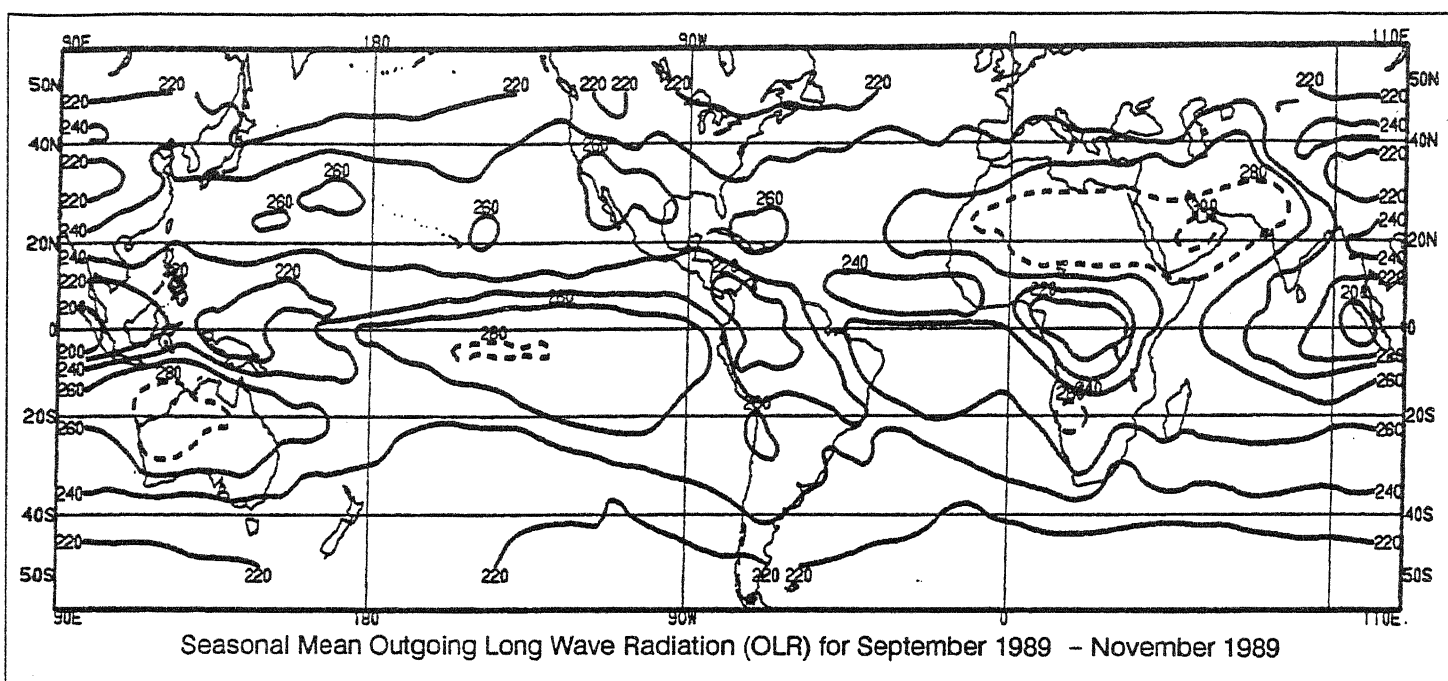


The anomalies on this chart are based on approximately 2500 observing stations for which at least 350 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the twelve month period is less than 100 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total twelve month precipitation exceeds 250 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of twelve month precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.



### EXPLANATION

The mean seasonal outgoing long wave radiation (OLR) as measured by the NOAA-9 AVHRR IR window channel by NESDIS/SRL (top). Data are accumulated and averaged over  $2.5^\circ$  areas to a  $5^\circ$  Mercator grid for display. Contour intervals are  $20 \text{ Wm}^{-2}$ , and contours of  $280 \text{ Wm}^{-2}$  and above are dashed. In tropical areas (for our purposes  $20^\circ\text{N} - 20^\circ\text{S}$ ) that receive primarily convective rainfall, a mean OLR value of less than  $200 \text{ Wm}^{-2}$  is associated with significant seasonal precipitation, whereas a value greater than  $260 \text{ Wm}^{-2}$  normally indicates little or no precipitation. Care must be used in interpreting this chart at higher latitudes, where much of the precipitation is non-convective, or in some tropical coastal or island locations, where precipitation is primarily orographically induced. The approximate relationship between mean OLR and precipitation amount does not necessarily hold in such locations.

The mean seasonal outgoing long wave radiation anomalies (bottom) are computed as departures from the 1979 - 1988 base period mean. Contour intervals are  $15 \text{ Wm}^{-2}$ , while positive anomalies (greater than normal OLR, suggesting less than normal cloud cover and/or precipitation) are dashed and negative anomalies (less than normal OLR, suggesting greater than normal cloud cover and/or precipitation) are solid.

